

# LABOR MARKET ANALYSIS

FOR PROGRAM RECOMMENDATION



**C·O·E**

CENTERS OF EXCELLENCE  
FOR LABOR MARKET RESEARCH

## ENTERPRISE MAINFRAME SYSTEM ADMINISTRATION IN THE GREATER SACRAMENTO REGION

North (Greater Sacramento)  
Center of Excellence

**FEBRUARY 2022**

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# SUMMARY

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The North/Far North Center of Excellence for Labor Market Research prepared this report to provide a labor market analysis of educational supply and occupational demand for middle-skilled career pathways in the North (Greater Sacramento) subregion. This report aims to determine if demand in the local labor market is unmet by the supply from existing community college programs and other postsecondary training providers.

This report primarily focuses on training that leads to jobs in middle-skilled occupations - jobs that typically require education beyond a high school diploma but less than a Bachelor's degree - but may include higher-skilled occupations for training pathways that lead to a bachelor's degree. Lowered skilled occupations are rarely considered in this type of analysis due to the lessened barriers for entry-level work, such as no formal education and on-the-job training requirements.

Key findings include:

- The North (Greater Sacramento) subregion held 3,245 enterprise mainframe system administration jobs in 2020. Enterprise mainframe system administration jobs are projected to increase by 5% over the next five years, adding 162 new jobs to the subregion by 2025.
- Over the next five years, enterprise mainframe system administration jobs are projected to have 251 annual openings in the North (Greater Sacramento) subregion.
- Wage data shows that enterprise mainframe system administration occupations earn \$12 to \$21 above the subregion's living wage of \$14.53 per hour.
- Although North (Greater Sacramento) community colleges conferred an average of 72 awards (certificates and degrees) under the Computer Infrastructure and Support (0708.00) TOP code, there are few programs focused on enterprise mainframe system administration.

Recommendations include:

- The North (Greater Sacramento) Center of Excellence recommends moving forward with the program.
- Due to entry-level education requirements and employer preferences, the North (Greater Sacramento) Center of Excellence strongly recommends including a transfer pathway as part of any enterprise mainframe system administration program.

# INTRODUCTION

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The North (Greater Sacramento) Center of Excellence (COE) was asked to provide labor market information for a proposed program at a regional community college. This report focuses on the following Standard Occupational Classification (SOC) occupations and codes:

- These middle-skill occupations require more education and training beyond a high school diploma but less than a four-year degree:
  - Computer Network Support Specialists (15-1231)
  - Computer Network Architects (15-1241)
  - Network and Computer Systems Administrators (15-1244)

A review of related programs revealed the following Taxonomy of Programs (TOP) title(s) and code(s) are appropriate for inclusion in this report:

- Computer Infrastructure and Support (0708.00)

The corresponding Classification of Instructional Program (CIP) title(s) and code(s) are:

- Network and System Administration/Administrator (11.1001)

# OCCUPATIONAL DEMAND

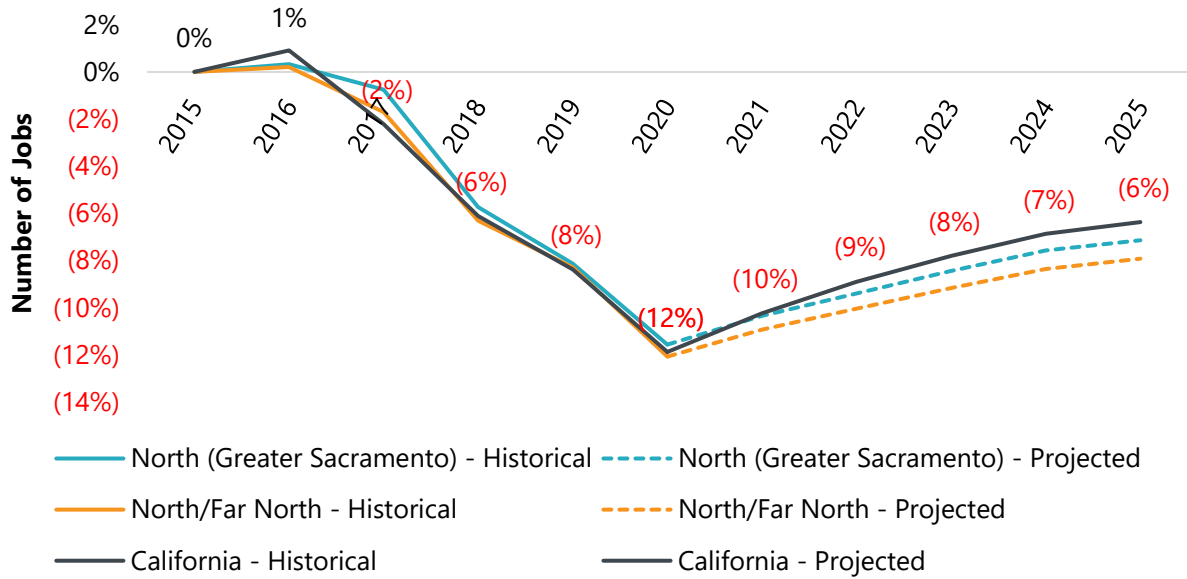
Exhibit 1 summarizes the five-year projected job growth for middle-skill and high-skill occupations in the North, North/Far North, and California.

**Exhibit 1. Employment and projected demand, 2020-2025**

Occupation	2020 Jobs	2025 Jobs	2020-2025 Change	2020-2025 % Change	2020-2025 Annual Openings
Computer Network Support Specialists	915	967	53	6%	79
Computer Network Architects	685	712	28	4%	47
Network and Computer Systems Administrators	1,645	1,728	82	5%	125
<b>North (Greater Sacramento)</b>	<b>3,245</b>	<b>3,407</b>	<b>162</b>	<b>5%</b>	<b>251</b>
Computer Network Support Specialists	1,142	1,199	58	5%	96
Computer Network Architects	835	863	28	3%	57
Network and Computer Systems Administrators	1,872	1,968	96	5%	143
<b>North/Far North</b>	<b>3,848</b>	<b>4,030</b>	<b>182</b>	<b>5%</b>	<b>296</b>
Computer Network Support Specialists	15,971	17,234	1,263	8%	1,449
Computer Network Architects	18,909	19,905	996	5%	1,361
Network and Computer Systems Administrators	32,177	34,111	1,934	6%	2,518
<b>California</b>	<b>67,057</b>	<b>71,250</b>	<b>4,193</b>	<b>6%</b>	<b>5,328</b>

Exhibit 2 compares the percent change in jobs between 2015 through 2020 and the projected changes through 2025. The rate of change is indexed to the total number of jobs in 2015.

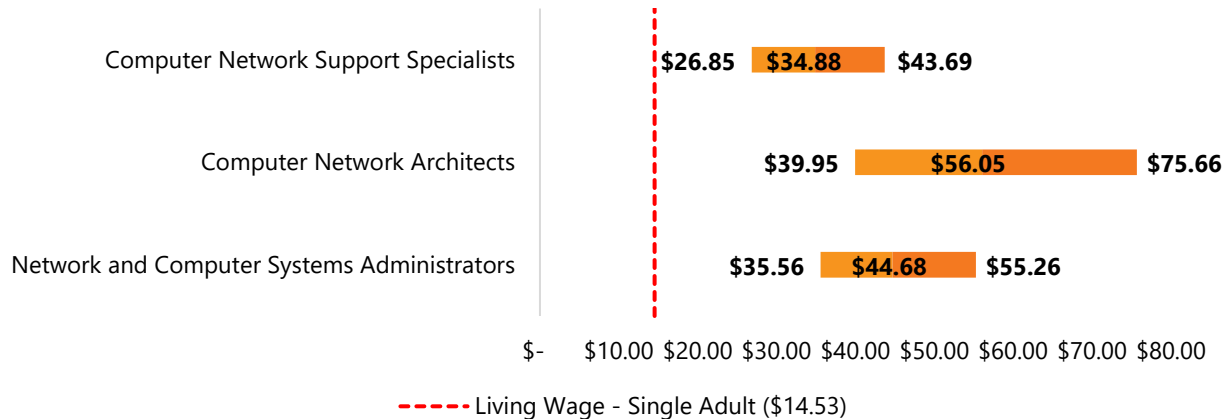
**Exhibit 2. Changes in employment, 2015-2025**



## WAGES

Exhibit 3 compares the entry-level, median, and experienced wages for the selected occupations to the North (Greater Sacramento) living wage for a single adult - \$14.53 per hour.<sup>1</sup>

**Exhibit 3. Comparison of wages by occupation, 2020**



<sup>1</sup> Living wage is defined as the level of income a single adult with no children must earn to meet basic needs, including food, housing, transportation, healthcare, taxes, and other miscellaneous basic needs. The 25th-percentile and 75th-percentile hourly wages are used as proxy for entry-level and experienced-level wages.

# JOB POSTINGS

This section analyzes recent data from online job postings (real-time LMI). Online job postings may provide additional insight into recent changes in the labor market that are not captured by historical trends.

The North COE identified 1,645 online job postings for the selected occupations in the Greater Sacramento subregion. Job postings data comes from Burning Glass Labor Insights and represents new listings posted online within the last year, from February 1, 2021, to January 31, 2022.

## Occupations and Job Titles

Exhibit 4 details the number of online job postings for the selected occupations.

### Exhibit 4. Number of job postings by occupation

Occupation	Job Postings	Share of Job Postings
Network and Computer Systems Administrators	882	54%
Computer Network Architects	556	34%
Computer Network Support Specialists	207	13%
<b>Total Job Postings</b>	<b>1,645</b>	<b>100%</b>

Exhibit 5 shows the top 10 job titles with the most job postings and the share. All job postings included a job title.

### Exhibit 5. Top jobs titles

Job Title	Job Postings	Share of Job Postings
Systems Administrator	85	5%
Network Engineer	63	4%
Senior Network Engineer	37	2%
Senior Systems Administrator	32	2%
Network Administrator	18	1%
Installation Coordinator	14	1%

Job Title	Job Postings	Share of Job Postings
Senior Automation Engineer Esc	14	1%
Information Technology Analyst	11	1%
Systems Support Analyst	11	1%
Systems Support Specialist	10	1%

## Employers

Exhibit 6 shows the top 10 employers with the most job postings for the selected occupations. Twenty-four percent (n = 387) of job postings did not include an employer.

### Exhibit 6. Employers with the most job postings

Employer	Job Postings	Share of Job Postings
Anthem Blue Cross	35	2%
UC Davis Health	25	2%
Accenture	22	1%
University of California, Davis	21	1%
Pacific Gas and Electric Company	17	1%
Deloitte	17	1%
Quest	15	1%
General Dynamics	15	1%
University of California	13	1%
Intel Corporation	13	1%



## Certifications, Skills, and Experience

Exhibit 7 shows the most relevant certifications requested by employers for the selected occupations. Sixty-four percent (n = 1,048) of job postings did not include certification information.

### Exhibit 7. Most in-demand certifications

Certification	Job Postings	Share of Job Postings
Cisco Certified Network Associate (CCNA)	103	6%
Cisco Certified Network Professional (CCNP)	90	5%
Security Clearance	87	5%
CompTIA Security+	86	5%
IT Infrastructure Library (ITIL) Certification	68	4%
Cisco Certified Internetwork Expert (CCIE)	51	3%

Exhibit 8 shows the specialized skills most requested by employers for the selected occupations.

### Exhibit 8. Most in-demand specialized skills

Specialized Skill	Number of Skill Mentions
System Administration	442
Technical Support	322
Project Management	282
Network Engineering	276
Linux	275
Cisco	273
Microsoft Active Directory	256
Customer Service	230
VMware	229

Specialized Skill	Number of Skill Mentions
Information Systems	225

Exhibit 9 shows employers' minimum level of education for job postings for the selected occupations. Forty-one percent (n = 672) of job postings did not include a preferred education level.

**Exhibit 9. Employer-preferred minimum education levels**

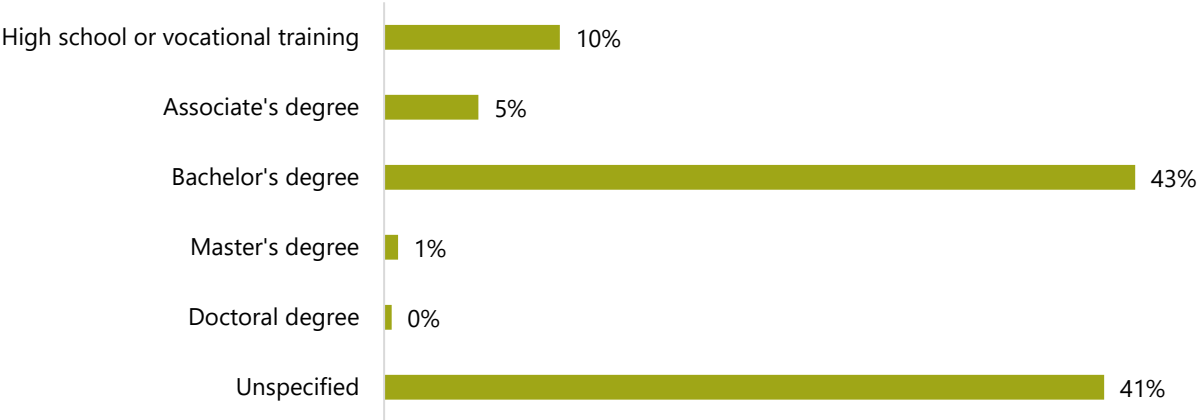
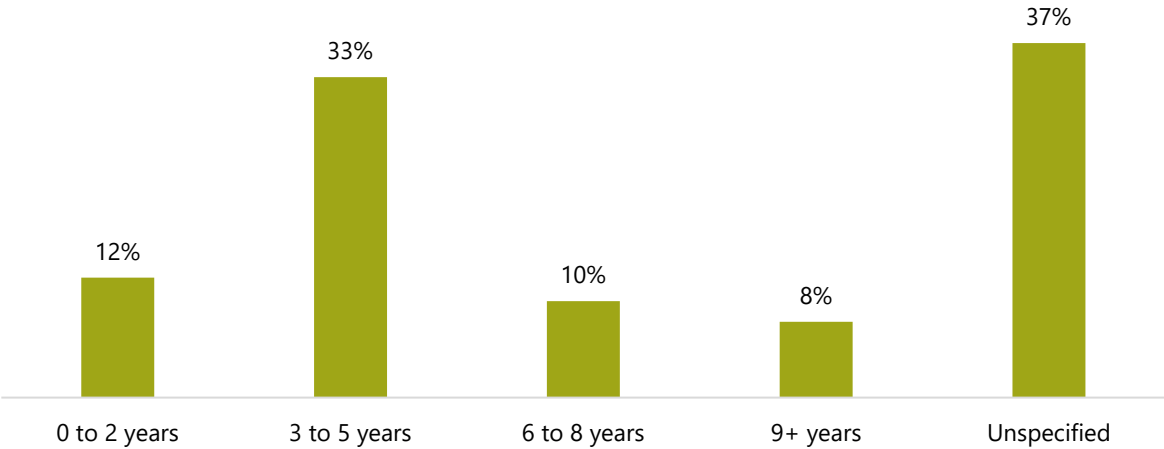


Exhibit 10 shows the experience levels required by employers for job postings for the selected occupations. Thirty-seven percent (n = 603) of job postings did not include a preferred education level.

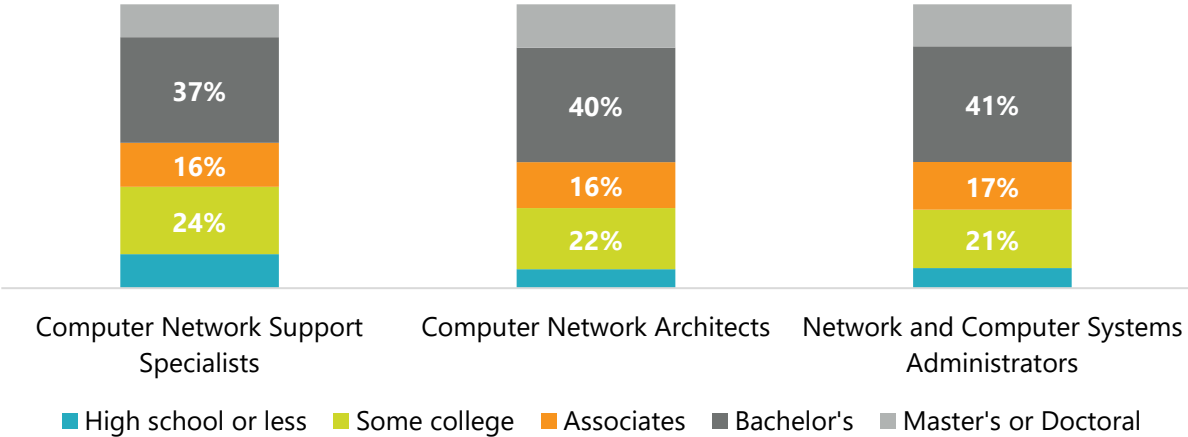
**Exhibit 10. Employer-preferred experience levels**



# EDUCATION AND TRAINING

The U.S. Census Bureau and Bureau of Labor Statistics collected data on education achieved by workers employed in occupations. Exhibit 11 shows the national-level educational attainment of the current workforce in the selected occupations.

**Exhibit 11. National worker educational attainment for selected occupations, 2019**



The Bureau of Labor Statistics (BLS) uses a system to assign categories for entry-level education, work experience in a related occupation, and typical on-the-job training to each occupation for which the BLS publishes projections data. Exhibit 12 shows the skill level and entry-level job requirements for the selected occupations.

**Exhibit 12. Typical education, work experience, and on-the-job training requirements**

Occupation	Typical Entry-level Education	Work Experience Required	On-the-job Training Required
Computer Network Support Specialists	Associate's degree	None	None
Computer Network Architects	Bachelor's degree	Five years or more	None
Network and Computer Systems Administrators	Bachelor's degree	None	None

## EDUCATIONAL SUPPLY

Educational supply for an occupation can be estimated by analyzing the number of awards issued in related Taxonomy of Programs (TOP) or Classification of Instructional Programs (CIP) codes. Exhibit 13 shows the TOP and CIP codes for educational programs related to the selected occupations.

**Exhibit 13. TOP and CIP codes for training programs related to the selected occupations**

TOP Programs and Codes	Aligned CIP Programs and Codes
Computer Infrastructure and Support (0708.00)	Network and System Administration/Administrator (11.1001)

### Community College Supply

Exhibits 14 and 15 compare the average number of certificates and degrees conferred in selected community college programs over the last three academic years.

**Exhibit 14. Annual average community college awards by program, 2017-18 through 2019-20**

Program - TOP Code	College	Annual Awards 2018-19	Annual Awards 2019-20	Annual Awards 2020-21	3-Yr Annual Awards Average
Computer Infrastructure and Support (0708.00)	American River	21	13	18	17
	Cosumnes River	4	5	17	9
	Sacramento City	17	18	16	17
	Sierra	38	22	21	27
	<b>Subtotal</b>	<b>80</b>	<b>58</b>	<b>72</b>	<b>72</b>
	<b>Grand Total</b>	<b>80</b>	<b>58</b>	<b>72</b>	<b>72</b>

**Exhibit 15. Annual average community college awards by type, 2017-18 through 2019-20**

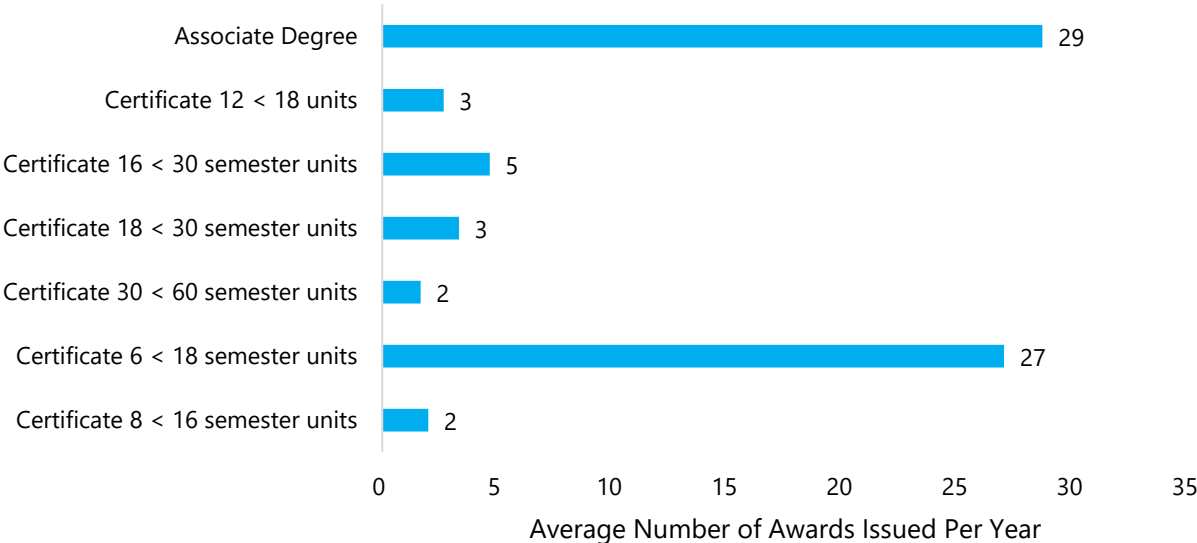


Exhibit 16 summarizes North (Greater Sacramento) Computer Infrastructure and Support (0708.00) community college programs, active as of February 10, 2022.

**Exhibit 16. North (Greater Sacramento) Computer Infrastructure and Support Programs**

College	Program Title	Award Offered
American River	Cybersecurity and Information Assurance	Certificate A.S. Degree
	Network Administration Essentials: Windows	Certificate
Cosumnes River	CIS: Cybersecurity	Certificate
	CIS: Information Systems Security	Certificate A.S. Degree
	Cybersecurity and Information Assurance	A.S. Degree
Sacramento City	Cloud Computing	Certificate
	Cybersecurity and Information Assurance	Certificate A.S. Degree

## Other Postsecondary Supply

Exhibit 17 compares the average number of degrees that non-community college training providers conferred in the North (Greater Sacramento) subregion over the last three academic years. Please note that non-community college data lags by one year.

**Exhibit 17. Other postsecondary awards by program, 2016-17 through 2018-19**

Program - CIP Code	College	Annual Awards 2017-18	Annual Awards 2018-19	Annual Awards 2019-20	3-Yr Annual Awards Average
Network and System Administration/Administrator (11.1001)	Asher College	71	75	0	49
	MTI	19	24	22	22
	<b>Subtotal</b>	<b>90</b>	<b>99</b>	<b>22</b>	<b>71</b>
	<b>Grand Total</b>	<b>90</b>	<b>99</b>	<b>22</b>	<b>71</b>

## FINDINGS

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- This report focuses on three occupations in the enterprise mainframe system administration pathway: computer network support specialists, network architects, and network and computer systems administrators.
- The North (Greater Sacramento) subregion held 3,245 enterprise mainframe system administration jobs in 2020. Enterprise mainframe system administration jobs are projected to increase by 5% over the next five years, adding 162 new jobs to the subregion by 2025.
  - Over half of the job growth is attributed to network and computer systems administrators, which will add 82 new jobs to the subregion by 2025.
- Jobs for enterprise mainframe system administration are projected to grow slightly slower in the North (Greater Sacramento) subregion than in California.
- Over the next five years, enterprise mainframe system administration jobs are projected to have 251 annual openings in the North (Greater Sacramento) subregion.
  - Half of the job openings will be for network and computer systems administrators, with 125 annual job openings from 2020 to 2025.
- Wage data shows that enterprise mainframe system administration occupations earn \$12 to \$21 above the subregion's living wage of \$14.53 per hour.
- According to real-time labor market information, there were about 1,645 online job postings for enterprise mainframe system administration occupations between February 1, 2021, and January 31, 2022.
  - Over half of job postings were for network and computer systems administrators, with 882 job postings during the same time frame.
  - Although 41% of job postings did not include a preferred education level, it seems that local employers may have a preference for enterprise mainframe system administration job candidates to hold a bachelor's degree in a related field of study.
- Between 38% and 40% of incumbent workers in the studied occupations have educational attainment levels consistent with community college offerings (some college or associate degrees). Another 37% to 41% of workers in these occupations hold a bachelor's degree.
  - The typical entry-level education for both network and computer systems administrators and computer network architects is a bachelor's degree.

- Four North (Greater Sacramento) community colleges offer degrees under the Computer Infrastructure and Support (0708.00) TOP code. Together, these programs conferred an average of 72 awards (certificates and associate degrees) over the last three academic years (2018-19 through 2020-21).
  - Although there are existing programs under the Computer Infrastructure and Support (0708.00) TOP code, few focus on enterprise mainframe system administration.
- Local non-community college postsecondary training providers also offer training related to the studied occupations. Between 2017-18 and 2019-20, non-community college training providers conferred an average of 71 awards in enterprise mainframe system administration programs over the last three years. Please note that non-community college awards data lags by one year.



# RECOMMENDATIONS

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- Based on a three-year average of annual awards in North (Greater Sacramento) subregion enterprise mainframe system administration programs and projected yearly openings, the supply gap analysis shows that the region seems to have room for additional training.
  - Together, community colleges and other postsecondary training providers issued an average of 143 awards over the last three years.
  - There are 251 projected annual openings for enterprise mainframe system administration jobs.
  - And, there are few programs focused on enterprise mainframe system administration.
- The North (Greater Sacramento) Center of Excellence recommends moving forward with the program.
- However, community colleges should either offer a transferable degree in enterprise mainframe system administration or ensure that the program aligns to an existing transfer-oriented pathway. Local employers seem to be looking for enterprise mainframe system administration job candidates with a bachelor's degree, and the typical entry-level education for two of the studied occupations is a bachelor's degree. Therefore, the North (Greater Sacramento) Center of Excellence strongly recommends including a transfer pathway in any enterprise mainframe system administration program.

COE Recommendation		
<b>Move forward with the program</b>	<b>Proceed with caution</b>	<b>Program is not recommended</b>
<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

## APPENDIX A. METHODOLOGY AND SOURCES

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This report identified Occupations using the Center of Excellence TOP-to-CIP-to-SOC crosswalk and O\*Net OnLine. This report's findings were determined using labor market data from the Bureau of Labor Statistics (BLS), U.S. Census Bureau data from Emsi, and jobs posting data from Burning Glass.

Cal-PASS Plus LaunchBoard. California Community Colleges Chancellor's Office.

<https://www.calpassplus.org/LaunchBoard/Home.aspx>.

Emsi 2021.4; QCEW Employees, Non-QCEW Employees, and Self-Employed.

<https://www.economicmodeling.com/>. EMSI occupational employment data are based on final EMSI industry data and final EMSI staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors).

Educational Attainment for Workers 25 Years and Older by Detailed Occupation, 2016-2017.

Bureau of Labor Statistics. <https://www.bls.gov/emp/tables/educational-attainment.htm#>.

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"Taxonomy of Programs." California Community Colleges Chancellor's Office. June 2012, 6<sup>th</sup> Edition. <https://www.cccco.edu/-/media/CCCCO-Website/About->

[Us/Divisions/Educational-Services-and-Support/Academic-Affairs/What-we-do/Curriculum-and-Instruction-Unit/Files/TOPmanual6200909corrected12513pdf.aspx](https://www.coecc.net/Us/Divisions/Educational-Services-and-Support/Academic-Affairs/What-we-do/Curriculum-and-Instruction-Unit/Files/TOPmanual6200909corrected12513pdf.aspx)

"TOP-CIP-SOC Crosswalk." Centers of Excellence for Labor Market Research. November 2015 Edition. <http://coecc.net/>

**COVID-19 Statement:** This report includes employment projection data by EMSI. EMSI's projections are modeled on recorded (historical) employment figures and incorporate several underlying assumptions, including the assumption that the economy during the projection period will be at approximately full employment or potential output. To the extent that a recession or labor shock, such as the economic effects of COVID-19, can cause long-term structural change, they may impact the projections. At this time, it is not possible to quantify the impact of COVID-19 on projections of industry and occupational employment. Other measures such as unemployment rates and monthly industry employment estimates will reflect the most recent information on employment and jobs in the state and, in combination with input from local employers, may help validate current and future employment needs as depicted here.

**Important Disclaimer:** All representations included in this report have been produced from primary research and/or secondary review of publicly and/or privately available data and/or research reports. Efforts have been made to qualify and validate the accuracy of the data and the reported findings; however, neither the Centers of Excellence, COE host District, nor California Community Colleges Chancellor's Office are responsible for applications or decisions made by recipient community colleges or their representatives based upon components or recommendations contained in this study.

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FOR LABOR MARKET RESEARCH

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